



# **The Impact of the Fermi Education Program (2001-2015)**

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November 12, 2015



# NASA Education Framework

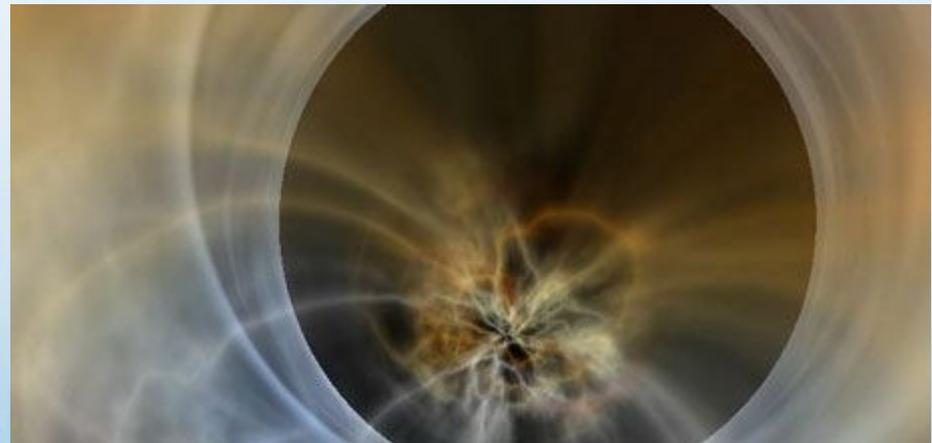
- In 2013 NASA announced a change to their long-standing framework for E/PO
- Education - to be handled by Agency-selected teams proposed to 2015 CAN-AO
  - K-12 STEM formal
  - Informal education
  - Higher Education
- Communications and Outreach – still the responsibility of individual missions

# Informal Education

- Paper products
  - GLAST/Fermi models – over 9000
  - GLAST/Fermi lithos – over 10,000
  - GLAST/Fermi factsheets – over 10,000
  - GLAST/Fermi card game – over 7000
- Space Mysteries – interactive video games
- After-school clubs, websites, exhibits, and more...

# Black Hole Planetarium Show

- Seed funded by GLAST E/PO
- Directed by Tom Lucas
- Narrated by Liam Neeson
- Premiered 1/10/06 at the Denver Museum of Nature & Science
- Seen by  $> 10^6$  world-wide
- Over 30K FAQs



# Epo`s Chronicles

- Weekly from 2008-2013
- Translated into French, Spanish and Italian
- Calendars for 2010 featured IYA “Go Observe” objects
- Calendars for 2011 featured high-energy astrophysics missions including Fermi
- About 1500 calendars distributed in 2010 and 2011
- Read by about 7,000 per month, 80,000 unique IPs per year in 2013



Alkina

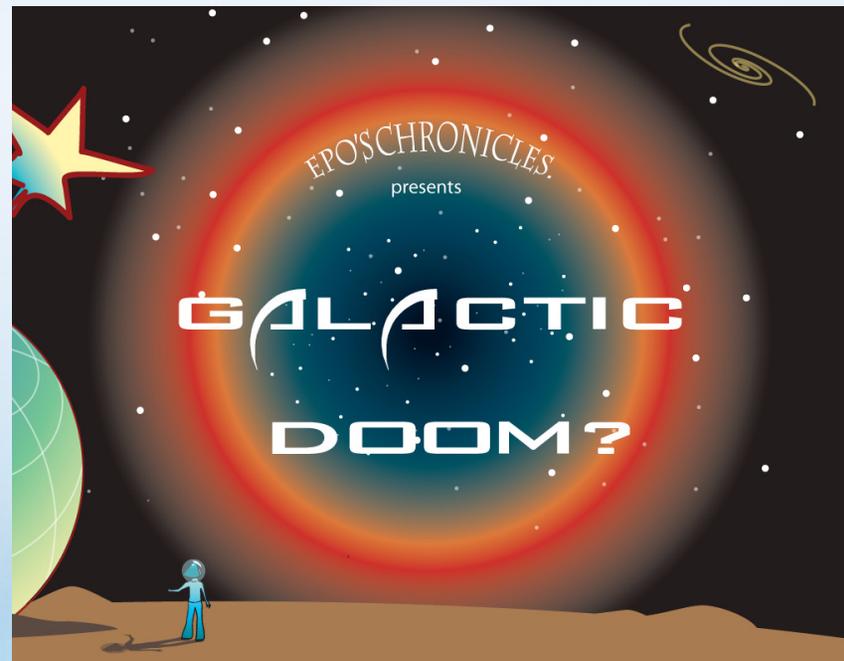


Epo

# Space Mysteries

- Interactive video games that teach astronomy
- Original 3 mysteries funded by NASA LEARNERS
- Two more mysteries funded by Fermi E/PO
  - Solar Supernova?
  - Galactic Doom?
- Played by over 40K over past 10 years

<http://mystery.sonoma.edu>



# Supernova! Toolkit

- Developed by ASP for NSN of over 200 amateur astro clubs
- Over 246,000 attendees through 2000 events (through 10/15)
- Over 39,000 minorities and over 59,000 women/girls



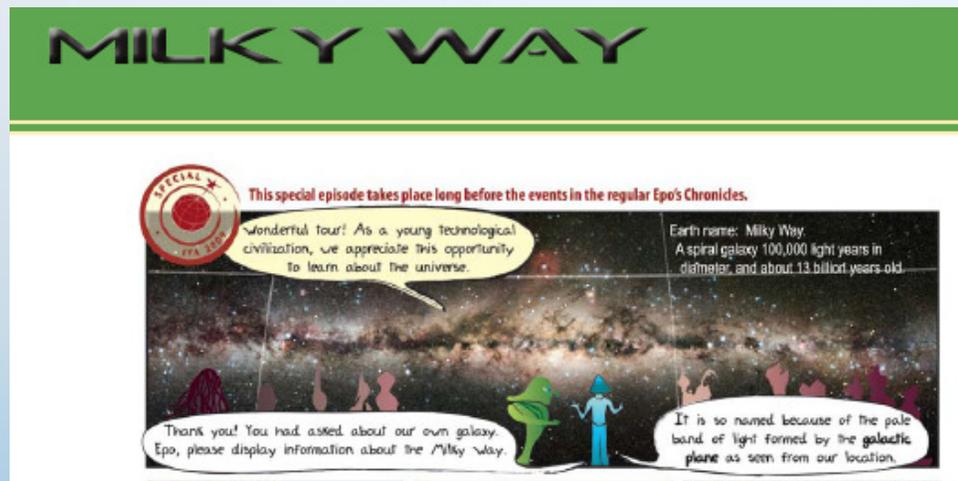
Joint with  
Swift, XMM  
and Suzaku

***Night Sky Network***

Astronomy Clubs bringing the wonders of the universe to the public

# IYA 2009

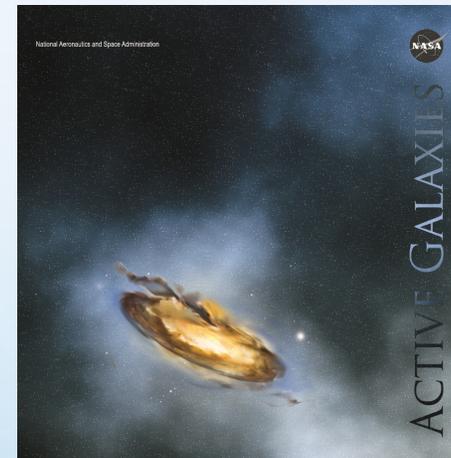
- Epo's Chronicles Lithos for each month's "Go Observe" object
- Over 18,000 distributed through NSN
- Traveling exhibit reached over 100K in SF Bay Area



Joint with  
Swift, XMM-  
Newton

# Elementary & Secondary Education

- Standards-aligned classroom materials
  - Active Galaxy Educator's Guide & Pop-up
  - Supernova Educator's Guide
  - Black Hole Resources
  - 3 TOPS guides
    - Far Out Math
    - Scale the Universe
    - Pi in the Sky
  - Educator training
    - Educator Ambassadors
    - NASA's Multi-wavelength Universe online course





# Classroom Materials for grades 5-12

- Approved by NASA and in wide distribution:
  - Active Galaxy Educator's guide > 6000
  - Active Galaxy Pop-up and guide > 3000
  - Supernova Educator's Guide > 3000
  - TOPS Far Out Math > 3000
  - TOPS Scale the Universe > 5000
  - TOPS Pi in the Sky > 2500
  - Additional distribution through downloads (about 10,000 per year for all Fermi guides)

# Educator Ambassadors

- Long-term Fermi EAs
  - Jeff Adkins (CA)
  - Teena Della (BC)
  - Mary Garrett (MI then GA)
  - Daryl Taylor (NJ then CT)
  - Pam Whiffen (AZ)
  - Christine Royce (PA)
  - Mandy Frantti (MI)
  - Linda Smith (NJ)
- Have reached over 37,000 students and teachers through over 375 lectures, mini-courses and workshops
- Bi-annual trainings 2004, 2006, 2008, 2010, 2012
- Some may continue...?



Linda  
Smith



Teena  
Della

# Astro4Girls

- Fermi Educator Ambassadors Whiffen, Smith, Della and Frantti
- Partnership with public libraries in underserved regions of the USA



Joint with  
other  
Astrophysics  
missions

# Multi-wavelength Universe professional development

- Offered in 2011 and 2012
- About 25 educators each year
- Online course



<https://universe.sonoma.edu/cosmo/course/view.php?id=5>

# Higher Education

- Authentic research experiences through the Global Telescope Network
- ~42 partner institutions
- ~10<sup>3</sup> HS and college students have gotten data
- 15 SSU HS summer interns
- >4K observations of > 30 Blazars
- Part of Skynet with UNC Prompt telescopes in Chile



New GORT dome at Pepperwood

<http://gtn.sonoma.edu>



# Big Ideas in Cosmology

- Joint funded by Fermi and EPOESS
- Digital-first, media-rich curriculum for general education college students
- 18 units of material = 2+ semesters of Astronomy
- Informed by pre-conception research
- Specifically designed for hybrid (flipped) or online



<http://www.greatriverlearning.com/Cosmology>

# NASA Evaluation

- All Fermi formal and informal products have passed NASA education product review and are listed at <http://nasawavelength.org>

## Audience

Elementary school (1)

Middle school (3)

High school (24)

Higher education (7)

Informal education (22)



NASAWAVELENGTH

A Full Spectrum of NASA Resources for Earth and Space Science Education

# Impact Summary

- Fermi Education programs have:
  - Provided informal materials to  $>5 \times 10^4$  students and teachers
  - Provided informal multimedia experiences to audiences  $> 10^6$  through websites, planetarium programs, IYA exhibits and more
  - Trained  $>3.7 \times 10^4$  teachers to use formal materials through EA program (short-duration evaluated workshops)
  - Trained 50 teachers through NASA's Multi-wavelength Universe (long-duration academic credit course)
  - Over 300 students using Big Ideas in Cosmology so far
  - Provided formal materials to  $\sim 10^5$  teachers via web
  - Involved  $> 10^3$  students in authentic STEM research through GTN/ground-based visible light observations

# The Future

- SSU is part of NASA's Universe of Learning team, led by STScI and selected by HQ
- Transition planning during 2016
  - Websites?
  - Paper products?
- Educator Ambassador program may continue
- Emphasis on pre-service teacher training, STEM experiences with URMs
- Need to ensure Fermi science results are part of the plans going forward
- SSU will continue to support C&O